International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Indigenous Inland Fisheries Development and Management in India

Dr Syeda Kahkashan Tanveer Fatima[1], Dr Reshma Sambanna[2], Prof. K. Vijaykumar[3]

[1]Assistant Professor, Department of Zoology, Smt A.S.M. College for Women,Ballari, Karnataka.
[2]Assistant Professor, Department of Zoology, Smt V G Degree College for Women, Kalaburagi, Karnataka.
[3]Chiarmain, Department of Zoology, Gulbarga Unoversity, Kalaburagi, Karnataka.

Abstract

This paper provides a comprehensive review and analysis of indigenous inland fisheries development and management practices in India. Drawing on extensive literature review and case studies, it examines traditional ecological knowledge, community-based management systems, and the integration of indigenous practices with modern scientific approaches. The research highlights the diversity of inland fisheries across India's varied ecosystems and the critical role of indigenous communities in sustainable resource management. Key challenges including overfishing, habitat degradation, and socioeconomic pressures are analyzed. The paper proposes policy recommendations to support and scale indigenous management practices while addressing conservation needs. Findings underscore the importance of participatory, culturally-appropriate approaches that leverage local knowledge for inland fisheries development in India.

Keywords: inland fisheries, indigenous knowledge, traditional ecological knowledge (TEK), community-based management, aquatic ecosystems, fisheries development, sustainable management, traditional fishing methods, habitat conservation

1. Introduction

Inland fisheries play a crucial role in food security, livelihoods, and cultural traditions across India. With over 3 million hectares of reservoirs, 2.9 million hectares of ponds and tanks, 195,095 km of rivers and canals, and 1.2 million hectares of floodplain wetlands, India possesses vast and diverse inland fisheries resources (Sugunan, 2010). These aquatic ecosystems support rich biodiversity and have been managed by indigenous and local communities for centuries using traditional ecological knowledge and customary governance systems.

However, inland fisheries in India face mounting pressures from overfishing, habitat degradation, pollution, invasive species, and climate change impacts (Vass et al., 2009). There is growing recognition that conventional top-down management approaches have limitations, and that indigenous knowledge and community-based systems offer valuable insights for sustainable fisheries development (Berkes et al., 2000).

This paper provides a comprehensive review and analysis of indigenous inland fisheries development and management practices in India. The objectives are to:

1. Examine the diversity of traditional inland fisheries systems across India's varied aquatic ecosystems
2. Analyze indigenous ecological knowledge and management practices for inland fisheries
3. Assess the integration of traditional and scientific approaches in fisheries development
4. Identify key challenges and opportunities for supporting indigenous fisheries management
5. Propose policy recommendations to strengthen community-based inland fisheries governance

The research draws on extensive literature review spanning fisheries science, traditional ecological knowledge, and common property resource management. It incorporates case studies from different regions of India to highlight place-based practices. The paper aims to contribute to a more holistic understanding of inland fisheries management that recognizes the central role of indigenous communities and local institutions.

2. Overview of India's Inland Fisheries

2.1 Inland fisheries resources

India's diverse inland aquatic resources can be broadly categorized into:

1. Rivers and canals
2. Reservoirs
3. Floodplain wetlands
4. Ponds and tanks
5. Estuaries

Table 1 provides an overview of the extent of these resources and their fisheries potential.

Table 1. Inland fisheries resources of India

Resource type	Area/Length	Fisheries potential (million tonnes/year)
Rivers and canals	195,095 km	0.8
Reservoirs	3.15 million ha	1.8
Floodplain wetlands	1.2 million ha	1.0
Ponds and tanks	2.9 million ha	4.5
Estuaries	0.29 million ha	0.2

Source: DAHD (2019)

Rivers like the Ganga, Brahmaputra, Mahanadi, Godavari, Krishna, and Cauvery support diverse fish fauna and important capture fisheries. The construction of dams has created numerous reservoirs that are now significant fisheries resources. Floodplain wetlands locally known as beels, chaurs, pats, and jheels in eastern and northeastern India are highly productive ecosystems. Rural ponds and tanks, though individually small, collectively form a major resource for culture-based fisheries.

2.2 Inland fish production and consumption

Inland fish production in India has grown significantly in recent decades, increasing from 0.2 million to-

nnes in 1950-51 to 10.43 million tonnes in 2018-19 (DAHD, 2019). Figure 1 shows the trend in inland fish production over the past two decades.

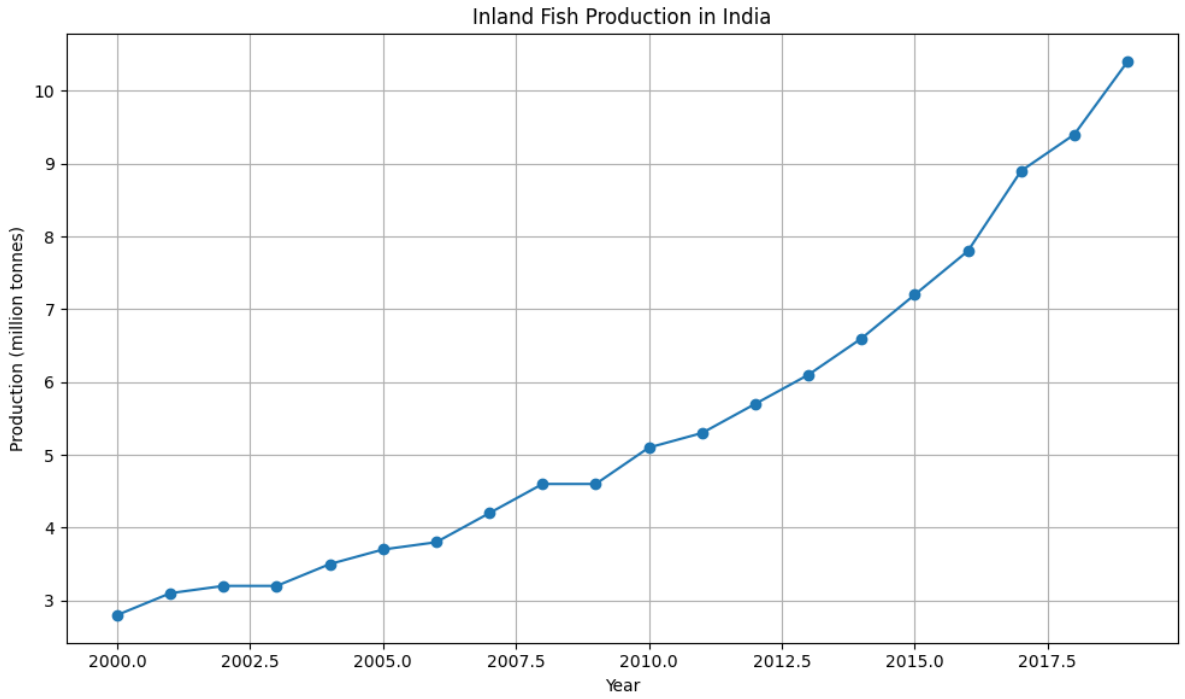

Figure 1. Trend in inland fish production in India, 2000-2019

The growth in production has been driven largely by expansion and intensification of aquaculture, particularly in ponds and tanks. However, capture fisheries from rivers, reservoirs, and wetlands remain important, especially for rural livelihoods and food security.

Per capita fish consumption in India is estimated at 5-6 kg/year, which is low compared to the global average of 20.5 kg/year (FAO, 2020). However, consumption varies widely across regions, being much higher in coastal and northeastern states. Inland fish form a significant portion of fish consumption in many parts of India, especially for rural and tribal communities.

2.3 Socioeconomic importance

The inland fisheries sector provides livelihoods to over 28 million people in India, including full-time and part-time fishers, fish farmers, and those engaged in allied activities (DAHD, 2019). Many of these are small-scale operators belonging to economically weaker sections of society. Indigenous and tribal communities in particular have strong cultural and economic ties to inland fisheries resources.

Beyond direct employment, inland fisheries contribute to food security, nutrition, and poverty alleviation in rural areas. Fish is an important source of affordable animal protein and micronutrients for many communities. The sector also supports ancillary industries like net-making, boat building, ice production, and fish processing.

3. Indigenous Ecological Knowledge in Inland Fisheries

3.1 Traditional ecological knowledge systems

Indigenous communities across India have developed sophisticated ecological knowledge systems related to inland fisheries through generations of close interaction with local ecosystems. This traditional

ecological knowledge (TEK) encompasses understanding of:

- Fish species diversity, behavior, and habitat preferences
- Seasonal variations in fish abundance and migration patterns
- Breeding cycles and spawning grounds
- Water quality indicators
- Aquatic vegetation and its role in fish habitats
- Linkages between terrestrial and aquatic ecosystems

TEK is typically holistic, viewing fisheries as part of broader socio-ecological systems. It often incorporates cultural and spiritual dimensions alongside empirical observations (Berkes et al., 2000).

3.2 Fish taxonomy and behavior

Many indigenous communities have detailed ethno-ichthyological knowledge, with local naming and classification systems for fish species. For example, the Nyishi tribe in Arunachal Pradesh recognizes over 50 fish species in local rivers and streams, categorizing them based on morphology, habitat, and behavior (Nimachow et al., 2010).

Traditional knowledge often includes acute understanding of fish behavior. Fishers in the Sundarbans can predict fish movements based on tidal patterns and lunar cycles (Ghosh and Ghosh, 2019). In Manipur, indigenous communities have mapped the breeding migrations of Osteobrama belangeri in the Loktak Lake system (Sharma, 2009).

3.3 Habitat and ecosystem knowledge

Indigenous ecological knowledge typically takes a landscape approach, recognizing connections between different components of aquatic and terrestrial ecosystems. For instance, tribal communities in central India understand the role of riparian vegetation in providing food and shelter for fish (Nath et al., 2015).

In the floodplains of Assam, traditional fishers have detailed knowledge of different wetland types (beels, swamps, marshes) and their ecological characteristics. This informs habitat-specific fishing practices and conservation measures (Baruah et al., 2013).

3.4 Environmental indicators

Many indigenous communities use bio-indicators to assess water quality and predict fish abundance. For example:

- Presence of certain aquatic plants indicates good water quality for fish in Tamil Nadu's temple tanks (Pandey et al., 2017)
- Appearance of specific insects signals the start of fishing season in Nagaland's rivers (Ao et al., 2013)
- Flowering of riparian trees is used to predict fish spawning times in West Bengal wetlands (Ghosh and Ghosh, 2019)

3.5 Climate and seasonal knowledge

Traditional calendars often incorporate detailed phenological knowledge related to fisheries. The Meitei community in Manipur recognizes 12 seasons based on changes in aquatic ecosystems and fish behavior (Sharma, 2009). This informs timing of fishing activities and conservation measures.

Indigenous climate knowledge includes understanding of long-term variability and extreme events. Fishing communities in the Sundarbans use traditional indicators to predict cyclones and adjust fishing patterns accordingly (Berkes et al., 2000).

4. Indigenous Fisheries Management Practices

4.1 Customary governance systems

Many indigenous communities have developed customary governance systems for inland fisheries that blend resource management with social and cultural norms. These typically involve:

- Defined resource boundaries and access rights
- Locally-appropriate rules and regulations
- Community-based monitoring and enforcement
- Mechanisms for conflict resolution
- Cultural and religious practices that support conservation

For example, the Nyishi tribe in Arunachal Pradesh has a system of clans (hoko) that regulate access to fishing grounds in local rivers. Each clan has customary rights over specific stretches, with rules on permissible fishing methods and seasons (Nimachow et al., 2010).

4.2 Fishing methods and gear

Indigenous communities have developed diverse fishing methods adapted to local ecological conditions. These often aim to minimize negative impacts on fish populations and habitats. Some examples include:

- Use of barrier and filter devices in streams that allow small fish to escape
- Traps designed to target specific species while avoiding juveniles
- Temporary brush parks that provide fish habitat and facilitate selective harvesting
- Hook and line methods that are highly selective

Many traditional fishing gears are made from locally available natural materials, making them biodegradable and reducing environmental impact.

4.3 Habitat management

Indigenous fisheries management often involves active habitat enhancement and protection measures. For example:

- Creating brush parks and fish aggregating devices in lakes and reservoirs
- Maintaining connectivity between rivers and floodplain wetlands
- Protecting riparian vegetation and spawning grounds
- Excavating ponds to provide dry season refuges for fish

In the wetlands of Manipur, indigenous communities practice phum namba - creating artificial floating islands using aquatic vegetation to provide fish habitat and breeding grounds (Sharma, 2009).

4.4 Stock enhancement

Traditional stock enhancement practices are common in many indigenous fisheries systems. These include:

- Transplanting fish and eggs between water bodies
- Protecting broodfish during breeding seasons
- Creating spawning and nursery habitats
- Supplementary feeding using local materials

In West Bengal, traditional fishers in beels practice katha fishing, where tree branches are submerged to attract fish and enhance local productivity (Bhaumik et al., 2017).

4.5 Closed seasons and protected areas

Many indigenous management systems incorporate spatial and temporal restrictions on fishing to allow stock regeneration. Examples include:

- Seasonal fishing bans during breeding periods

- Rotation of fishing grounds to allow recovery
- Designation of sacred pools or lake sections where fishing is prohibited
- Protection of deep pools as dry season refuges

The Apatani tribe in Arunachal Pradesh designates certain stream stretches as ngiing, where fishing is banned to serve as breeding sanctuaries (Singh and Borthakur, 2015).

4.6 Ritual and cultural practices

Cultural and religious practices often play a significant role in indigenous fisheries management. These can include:

- Harvest rituals that limit catch quantities
- Taboos on fishing certain species or in sacred areas
- Ceremonial fish releases to enhance stocks
- Traditional festivals that regulate fishing seasons

For instance, the Naga tribes in Nagaland have genna rituals that prohibit fishing for several days, allowing fish populations to recover (Ao et al., 2013).

5. Case Studies of Indigenous Fisheries Systems

5.1 Apatani valley fish-paddy culture, Arunachal Pradesh

The Apatani tribe in Ziro valley, Arunachal Pradesh practices a unique integrated fish-paddy cultivation system. Rice fields are modified to retain water and stock fish, primarily common carp and indigenous minnows. Key features include:

- Raised bunds and water inlets/outlets to manage water levels
- Integration of fish culture with rice, providing natural fertilization
- Use of traditional traps to selectively harvest larger fish
- Communal management of water resources
- Ritual practices regulating harvest times

This system demonstrates efficient use of limited land and water resources while conserving local fish diversity (Singh and Borthakur, 2015).

5.2 Phum fishing in Loktak Lake, Manipur

The Meitei fishing communities around Loktak Lake have developed the phum fishing technique adapted to the lake's unique phumdis (floating islands). This involves:

- Creating artificial fish aggregating areas using aquatic vegetation
- Encircling phums with nets to harvest fish
- Rotational use of fishing grounds
- Customary regulations on mesh sizes and fishing seasons
- Traditional knowledge of fish breeding cycles

The practice allows sustainable fishing while maintaining the lake's ecological character. However, it faces challenges from changing hydrology due to dam construction (Sharma, 2009).

5.3 Katha fishing in floodplain wetlands, West Bengal

Katha fishing is a traditional practice in the beels (oxbow lakes) of West Bengal. It involves:

- Submerging tree branches to create fish habitats
- Allowing colonization by periphyton and invertebrates
- Periodic harvesting using surrounding nets
- Community-based access regulations

- Combining with pond culture for stock enhancement

This low-cost method enhances fish production in shallow wetlands. However, overharvesting and use of fine-meshed nets pose sustainability challenges (Bhaumik et al., 2017).

5.4 Sacred pools in Western Ghats rivers

Many indigenous communities in the Western Ghats maintain sacred pools in rivers where fishing is prohibited. For example:

- The Malayali tribe protects pools near temples in Tamil Nadu's Kaveri River
- Kokni fishers in Maharashtra designate devrai (sacred groves) along rivers
- Sacred pools in Kerala are associated with snake worship traditions

These protected areas serve as biodiversity refuges and spawning sites. They demonstrate how cultural practices can support conservation goals (Dandekar, 2011).

5.5 Tribal fisheries in Narmada River, Madhya Pradesh

Several tribal communities along the Narmada River have traditional fishing systems adapted to the river's flow regime. Key aspects include:

- Seasonal fishing camps coinciding with fish migrations
- Use of temporary brush parks to create fish habitats
- Community regulations on fishing locations and gear
- Taboos protecting certain fish species
- Traditional knowledge of deep pool locations

These practices are threatened by dam construction and displacement of communities. However, efforts are ongoing to document and integrate traditional knowledge in river management plans (Nath et al., 2015).

6. Integration of Traditional and Scientific Approaches

6.1 Complementarity of knowledge systems

There is growing recognition that traditional ecological knowledge and scientific approaches can complement each other in fisheries management. TEK can provide:

- Long-term observational data on ecosystem changes
- Insights into complex ecosystem interactions
- Locally-relevant indicators and management practices
- Understanding of social and cultural contexts

Scientific methods can help:

- Validate and explain traditional knowledge
- Provide broader spatial and temporal perspectives
- Develop standardized monitoring protocols
- Model future scenarios under changing conditions

Integrating these knowledge systems can lead to more holistic and effective management strategies (Berkes et al., 2000).

6.2 Participatory research approaches

Participatory research methods are increasingly used to bridge traditional and scientific knowledge in fisheries. These include:

- Collaborative fish surveys and stock assessments
- Participatory mapping of fishing grounds and habitats

- Joint development of locally-appropriate indicators
- Community-based monitoring programs
- Two-way knowledge exchange workshops

For example, a project in the Sundarbans involved local fishers in mangrove habitat mapping, combining GPS technology with traditional knowledge of fish-habitat associations (Ghosh and Ghosh, 2019).

6.3 Validation of traditional practices

Scientific studies have validated many traditional fisheries management practices. Examples include:

- Effectiveness of seasonal fishing bans in protecting spawning stocks
- Ecological benefits of traditional brush parks in enhancing fish habitat
- Role of sacred groves in conserving native fish diversity
- Sustainability of certain indigenous fishing gears

Table 2 summarizes some key studies validating traditional practices.

Table 2. Scientific validation of traditional fisheries practices

Traditional practice	Scientific finding	Reference
Seasonal fishing bans	Increased fish abundance and size	Kumar et al. (2016)
Sacred pools	Higher fish diversity compared to fished areas	Dandekar (2011)
Brush parks	Enhanced periphyton production and fish biomass	Bhaumik et al. (2017)
Traditional traps	Size-selective, reducing juvenile catch	Nath et al. (2015)

6.4 Integrating TEK in fisheries assessments

Traditional ecological knowledge is being increasingly incorporated into formal fisheries assessments and management plans. This includes:

- Using local nomenclature and classification systems
- Incorporating traditional indicators in stock assessments
- Mapping customary fishing grounds and seasonal use patterns
- Documenting historical baselines through oral histories

The Central Inland Fisheries Research Institute (CIFRI) has developed protocols for integrating TEK in inland fisheries assessments, which are being applied in several states (Vass et al., 2009).

6.5 Co-management approaches

Co-management arrangements that combine traditional institutions with government agencies are emerging in some areas. These aim to:

- Legitimize and strengthen customary governance systems
- Provide legal recognition to community fishing rights
- Integrate local and scientific knowledge in decision-making
- Improve compliance through community participation

For example, in Assam's Manas Biosphere Reserve, a co-management system involves local Bodo communities in wetland fisheries management alongside the forest department (Baruah et al., 2013).

6.6 Challenges in knowledge integration

Despite growing efforts, several challenges remain in integrating traditional and scientific knowledge:

- Power imbalances and lack of trust between communities and officials
- Difficulties in translating between knowledge systems
- Loss of traditional knowledge due to socioeconomic changes
- Institutional barriers in formal fisheries management
- Inadequate policy and legal frameworks for co-management

Addressing these requires long-term commitment to participatory approaches and institutional reforms in the fisheries sector.

7. Challenges Facing Indigenous Inland Fisheries

7.1 Habitat degradation and loss

Many inland water bodies supporting indigenous fisheries face severe degradation due to:

- Pollution from agricultural runoff, industrial effluents, and urban waste
- Sedimentation and eutrophication
- Hydrological alterations from dams and water diversions
- Destruction of riparian and aquatic vegetation
- Encroachment and land use changes in wetlands

These impacts reduce fish productivity and threaten the viability of traditional management systems. Figure 2 shows the main factors contributing to inland fisheries habitat degradation in India.

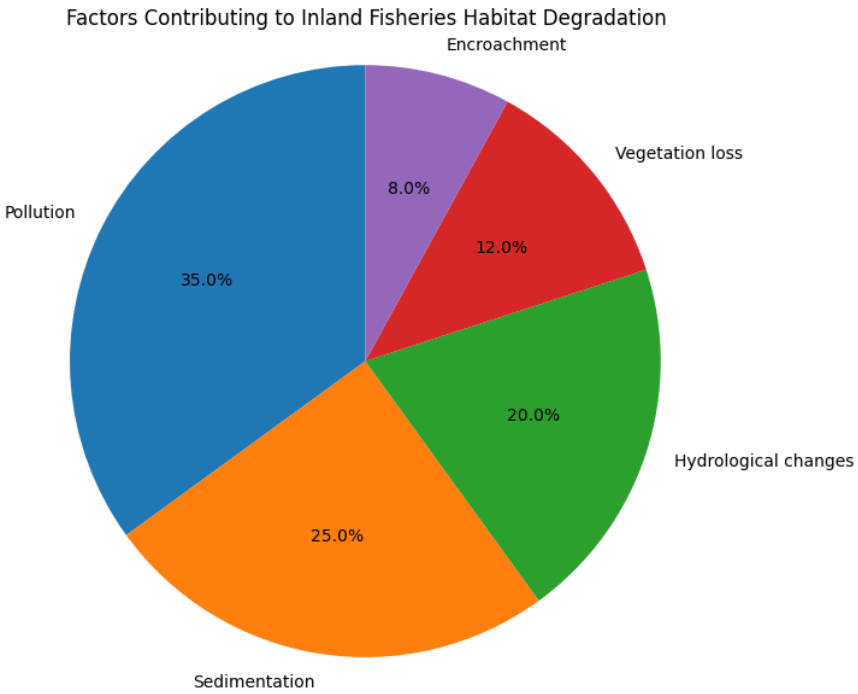

Figure 2. Main factors contributing to inland fisheries habitat degradation in India

7.2 Overfishing and destructive practices

Many inland fisheries face overfishing pressures due to:

- Growing demand and commercialization
- Use of intensive fishing gear like small-meshed nets
- Breakdown of traditional regulatory systems
- Illegal and unregulated fishing
- Exploitation of juveniles and broodfish

Some areas have seen adoption of destructive practices like dynamite fishing and poisoning, which can have long-term impacts on fish populations and habitats.

7.3 Loss of traditional knowledge and institutions

Rapid socioeconomic changes are leading to erosion of traditional ecological knowledge and customary institutions in many areas. Factors include:

- Out-migration of younger generations
- Shift to other livelihoods
- Formal education systems that devalue traditional knowledge
- Breakdown of traditional social structures
- Loss of local languages that encode ecological knowledge

This threatens the intergenerational transmission of sustainable fisheries practices.

7.4 Conflicts over resource access

Indigenous fishing communities often face conflicts over access to inland fisheries resources due to:

- Privatization and leasing of water bodies
- Encroachment by powerful stakeholders
- Exclusion from protected areas
- Competition with commercial operators
- Lack of clear tenure rights

These conflicts undermine traditional management systems and can lead to overexploitation of resources.

7.5 Climate change impacts

Climate change poses significant threats to inland fisheries through:

- Altered precipitation patterns affecting water availability
- Increased frequency of extreme events like floods and droughts
- Rising temperatures impacting fish physiology and phenology
- Shifts in species composition and invasive species spread
- Sea level rise affecting coastal freshwater habitats

Many indigenous communities report that traditional knowledge is becoming less reliable for predicting seasonal patterns, impacting fishing practices.

7.6 Policy and institutional challenges

Several policy and institutional factors hinder indigenous fisheries management:

- Lack of legal recognition for customary rights and practices
- Top-down management approaches that marginalize local knowledge
- Fragmented governance across multiple agencies
- Inadequate support for community-based management
- Insufficient investment in inland fisheries research and development

Addressing these requires reforms in fisheries governance to enable greater community participation and knowledge integration.

8. Opportunities for Supporting Indigenous Fisheries

8.1 Legal recognition of traditional rights

Providing legal recognition and protection for traditional fishing rights can strengthen indigenous management systems. This could involve:

- Recognizing customary tenure over fishing grounds
- Protecting traditional knowledge through intellectual property rights
- Ensuring free, prior and informed consent for development projects
- Legalizing co-management arrangements

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 provides a potential model for recognizing community rights over inland waters.

8.2 Documenting and valorizing traditional knowledge

Systematic documentation of traditional ecological knowledge related to fisheries is crucial for its preservation and integration into management. Approaches include:

- Participatory mapping and documentation projects
- Creation of local biodiversity registers
- Inclusion of TEK in fisheries education curricula
- Recognition of traditional knowledge holders as experts

Efforts like the People's Biodiversity Register initiative under the Biological Diversity Act, 2002 provide frameworks for TEK documentation.

8.3 Capacity building for community-based management

Strengthening local institutions and building capacity for community-based fisheries management is essential. This can involve:

- Training in organizational skills and financial management
- Developing locally-appropriate monitoring protocols
- Providing technical support for habitat restoration
- Facilitating exchange visits between fishing communities

Organizations like the M.S. Swaminathan Research Foundation have implemented such capacity building programs in coastal and inland fishing communities.

8.4 Market linkages and value addition

Supporting market access and value addition for indigenous fisheries products can enhance economic viability. Potential interventions include:

- Developing local processing and preservation techniques
- Creating marketing cooperatives and producer companies
- Certification schemes for sustainably-harvested fish
- Promoting culinary tourism around traditional fishing cultures

The success of women's self-help groups in fish processing in states like Kerala provides models that could be adapted for inland fisheries.

8.5 Ecosystem-based management approaches

Adopting ecosystem-based approaches can help address the interconnected challenges facing inland fisheries. This involves:

- Integrated watershed management
- Restoration of riparian habitats and wetlands
- Managing connectivity between rivers and floodplains
- Addressing land-based sources of pollution
- Considering fisheries in water allocation decisions

The National Mission for Clean Ganga provides opportunities for integrating traditional knowledge in river basin management.

8.6 Collaborative research and monitoring

Promoting collaborative research involving scientists and indigenous communities can strengthen the knowledge base for fisheries management. This could include:

- Participatory stock assessments and habitat mapping
- Joint development of indicators and thresholds
- Community-based monitoring of water quality and fish catches
- Action research on climate change adaptation strategies

The Indian Council of Agricultural Research (ICAR) has initiated programs for participatory inland fisheries research that could be further expanded.

9. Policy Recommendations

Based on the analysis of challenges and opportunities, the following policy recommendations are proposed to support indigenous inland fisheries development and management in India:

1. Develop a comprehensive national policy on inland fisheries that recognizes the role of indigenous knowledge and community-based management systems.
2. Enact legislation to protect traditional fishing rights and provide legal backing for co-management arrangements in inland waters.
3. Create a dedicated fund to support documentation of traditional ecological knowledge related to inland fisheries across different regions of India.
4. Establish a national-level capacity building program for community-based inland fisheries management, with a focus on indigenous and tribal fishing communities.
5. Integrate traditional ecological knowledge into inland fisheries research, education, and extension programs of fisheries institutions.
6. Develop guidelines for incorporating indigenous knowledge and practices in environmental impact assessments for projects affecting inland waters.
7. Promote ecosystem-based approaches to inland fisheries management that consider the entire watershed and recognize linkages between aquatic and terrestrial systems.
8. Create mechanisms for representation of indigenous fishing communities in decision-making bodies related to inland water management at local, state, and national levels.
9. Support formation of multi-stakeholder platforms to facilitate knowledge exchange and conflict resolution in inland fisheries management.
10. Invest in research on climate change impacts on inland fisheries and support community-based adaptation strategies building on traditional knowledge.
11. Develop certification and eco-labeling schemes for inland fish products harvested using traditional sustainable practices to enhance market value.

12. Strengthen monitoring and enforcement mechanisms to address destructive fishing practices and overfishing in inland waters, involving local communities.
13. Create a national database on inland fisheries that incorporates both scientific data and traditional ecological knowledge to inform adaptive management.
14. Review and harmonize policies across sectors (e.g., water, agriculture, forests) to minimize negative impacts on inland fisheries and fishing communities.
15. Promote international cooperation and knowledge exchange on indigenous inland fisheries management, particularly with other South and Southeast Asian countries facing similar challenges.

10. Conclusion

Indigenous inland fisheries systems in India represent a rich repository of ecological knowledge and sustainable management practices developed over generations. These systems are closely linked to local cultures and livelihoods, playing a crucial role in food security and biodiversity conservation. However, they face significant challenges from environmental degradation, socioeconomic changes, and policy neglect.

This review highlights the diversity and sophistication of traditional ecological knowledge related to inland fisheries across India. From complex fish-paddy systems in Northeast India to sacred pools in Western Ghats rivers, indigenous communities have developed locally-adapted approaches to fisheries management. Many of these traditional practices have been validated by scientific studies, demonstrating their relevance for contemporary resource management.

The integration of indigenous knowledge with scientific approaches offers promising pathways for sustainable inland fisheries development. Participatory research, co-management arrangements, and ecosystem-based approaches can help bridge traditional and modern systems. However, realizing this potential requires addressing power imbalances, strengthening local institutions, and creating enabling policy environments.

The policy recommendations proposed in this paper aim to create a supportive framework for indigenous inland fisheries that recognizes traditional rights, builds local capacity, and promotes knowledge integration. Implementing these will require coordinated efforts across multiple sectors and stakeholders.

As India seeks to develop its vast inland fisheries resources, indigenous knowledge and management systems offer valuable insights for sustainable and equitable approaches. Strengthening these systems can contribute not only to fisheries productivity but also to broader goals of biodiversity conservation, climate resilience, and cultural preservation. Further research and pilot initiatives are needed to develop context-specific strategies for supporting indigenous fisheries across India's diverse aquatic ecosystems.

References

1. Ao, T., Yuki, K., & Yasuhiro, O. (2013). Indigenous fishing techniques in the hills of Nagaland, India. Tropics, 22(2), 57-68.
2. Baruah, D., Dutta, A., & Pravin, P. (2013). Traditional fish trapping devices and methods in the Brahmaputra valley of Assam. Indian Journal of Traditional Knowledge, 12(1), 123-129.
3. Berkes, F., Colding, J., & Folke, C. (2000). Rediscovery of traditional ecological knowledge as adaptive management. Ecological Applications, 10(5), 1251-1262.
4. Bhaumik, U., Sharma, A. P., & Pandit, A. (2017). Impact assessment of brush park (Katha) fisheries on the ecology and fish production of floodplain wetlands of West Bengal. Aquatic Ecosystem Heal-

th & Management, 20(1-2), 59-68.
5. Dandekar, P. (2011). India's community fish sanctuaries protect wild fish and rivers. World Rivers Review, 26(1), 1-7.
6. Department of Animal Husbandry, Dairying and Fisheries (DAHD). (2019). Handbook on Fisheries Statistics 2018. Ministry of Agriculture and Farmers Welfare, Government of India.
7. Food and Agriculture Organization (FAO). (2020). The State of World Fisheries and Aquaculture 2020. Rome.
8. Ghosh, S., & Ghosh, A. (2019). Traditional ecological knowledge (TEK) of fishing communities in the Sundarbans: Implications for conservation and sustainable management. In Sundarbans Mangrove Systems (pp. 199-220). Springer, Cham.
9. Kumar, R., Mohanty, B. P., Sharma, A. P., & Athithan, S. (2016). Impact of closed season on the fisheries of Chilika Lake, Odisha, India. Indian Journal of Geo-Marine Sciences, 45(9), 1137-1143.
10. Nath, S., Mishra, S. K., & Choudhury, S. (2015). Traditional fishing techniques of Narmada river system in Central India. Indian Journal of Traditional Knowledge, 14(1), 113-120.
11. Nimachow, G., Joshi, R. C., & Dai, O. (2010). Role of indigenous knowledge system in conservation of forest resources: A case study of the Aka tribes of Arunachal Pradesh. Indian Journal of Traditional Knowledge, 9(2), 338-343.
12. Pandey, D. N., Gupta, A. K., & Anderson, D. M. (2017). Role of traditional knowledge in biodiversity conservation and climate change adaptation: A case study of temple tanks in Tamil Nadu, India. Journal of Environmental Management, 193, 194-202.
13. Sharma, B. K. (2009). Indigenous technical knowledge (ITK) on fisheries in Manipur, India. Indian Journal of Traditional Knowledge, 8(1), 146-149.
14. Singh, R. K., & Borthakur, A. (2015). Traditional fish farming practices and related belief systems in Apatani plateau of Arunachal Pradesh, India. Indian Journal of Traditional Knowledge, 14(4), 629-637.
15. Sugunan, V. V. (2010). Inland fisheries resource enhancement and conservation in India. RAP Publication, 22, 35-60.
16. Vass, K. K., Mondal, S. K., Samanta, S., Suresh, V. R., & Katiha, P. K. (2009). The environment and fishery status of the River Ganges. Aquatic Ecosystem Health & Management, 13(4), 385-394.